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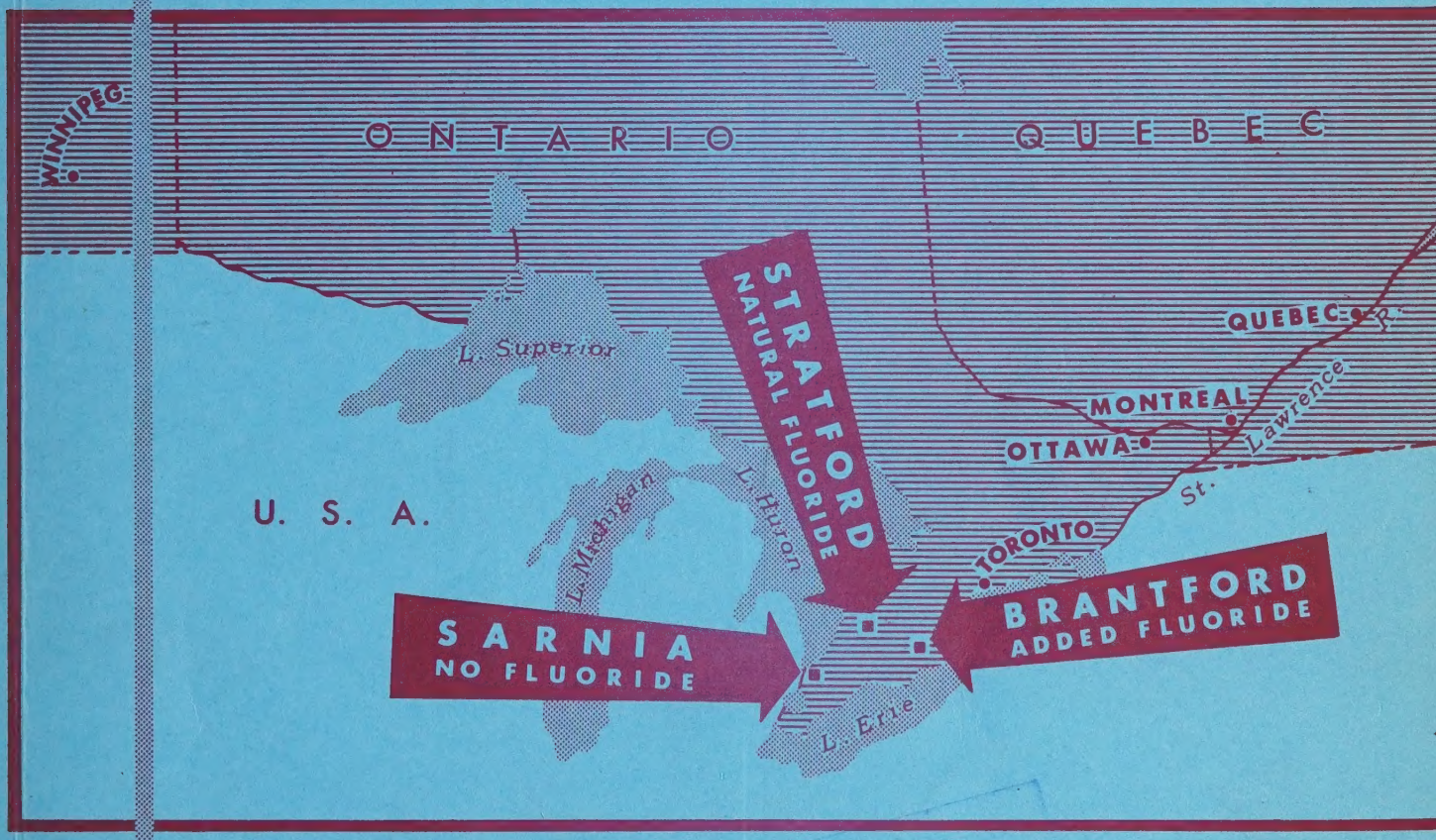

1954 REPORT

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DEPARTMENT OF NATIONAL HEALTH AND WELFARE
OTTAWA

PREFACE

Twelve years ago (in 1942) Dr. W.L. Hutton, the Medical Officer of Health of Brant County, Ontario, led the health and civic authorities of Brantford to study the reports from various parts of the world dealing with the beneficial dental effects of water containing about 1 part per million of fluoride. At that time all such water supplies -- there are many of them in Canada -- obtained their fluoride by passing through underground deposits of fluoride compounds. Brantford uses water from the Grand River, which does not come in contact with any fluoride deposit. Following nearly three years of study and discussion, Brantford became the first city in Canada to add fluoride to its water supply, and one of the first three in the world to do so, in June 1945. A concentration of 1 to 1.2 parts per million has been maintained continuously since that time.

A study, including a pre-fluoridation survey, was undertaken by the school dentist, Dr. B. Linscott, and this was subsequently reported in the Canadian Journal of Public Health (1). However, the need for control groups, and the use of more extensive facilities than were available to the local Department of Health, led to the request that the Department of National Health and Welfare undertake a study. This Department then made arrangements to compare the dental caries experience in Brantford over a period of time with that in Sarnia where the fluoride content of the water supply is negligible, and with that in Stratford where the water supply, obtained from deep wells, has contained 1.3 to 1.6 parts per million of fluoride* from natural deposits continuously since 1917. As Brantford, with consultative services from the Ontario Department of Health, had already undertaken the technical work connected with the addition of sodium fluoride to the water, and had arranged for daily water analysis, the Department of National Health and Welfare assumed only the responsibility of conducting a study of the dental effects.

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* In former reports this concentration has been given as 1.3 parts per million. Water is obtained from 7 deep wells each having a different fluoride concentration. There is some variation in the volume pumped from each well, and it is now considered that the average fluoride concentration in the mains should be stated as about 1.6 parts per million.

It is intended to continue the study at Brantford and the two control cities, with a view to observing developments in relation to the rest of the permanent teeth of the children born in Brantford subsequent to June 1945. These teeth will erupt between now and 1957, with the exception of the third molars (wisdom teeth), which are not being considered in this work.

This report has been prepared by H.K. Brown, D.D.S., D.D.P.H., Dental Consultant, Department of National Health and Welfare, with the assistance of H.R. McLaren, D.D.S., D.D.P.H., Dental Health Division, and Barbara J. Stewart, B.A., (statistician) Research Division, Department of National Health and Welfare.

H.K. Brown
Dental Consultant

MASS CONTROL OF DENTAL CARIES BY FLUORIDATION OF A PUBLIC WATER SUPPLY

DENTAL EFFECTS OF WATER FLUORIDATION

Fourth Report

on

The Brantford Fluoridation Caries Study

(Surveys in 1948, 1951, 1953 and 1954, with Sarnia and Stratford as controls)

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TABLE OF CONTENTS

	Page
PURPOSE OF THE STUDY	1
HISTORY OF THE STUDY	1
SELECTION OF CHILDREN FOR EXAMINATION	2
METHOD OF EXAMINING AND RECORDING	3
FINDINGS	5
Percentage of Children Having Caries-Free Permanent Teeth	9
Tooth Mortality	11
Mean DMF Permanent Teeth	13
First Permanent Molars	17
Upper Permanent Incisors	21
Deciduous Teeth	25
Oral Hygiene	27
Mottled Enamel	28
Other Effects of Fluoridation	28
SUMMARY	29
BIBLIOGRAPHY	33

LIST OF TABLES

Table		Page
1.	Total Children Eligible and Total Examined, by Age Group, Brantford, Sarnia, and Stratford, 1948, 1951, 1953 and 1954	4
2.	Percentage of Children Having Caries-Free Permanent Teeth	8
3.	Mean Tooth Mortality (missing and irreparable) Permanent Teeth per 100 Children	12
4.	Mean DMF (decayed, missing, filled) Permanent Teeth per Child	14
5.	Percentage of Children Having Caries-Free First Permanent Molars	18
6.	Mean DMF (decayed, missing, filled) First Permanent Molars per Child	20
7.	Percentage of Children Having Caries-Free Permanent Upper Incisors	22
8.	Mean DMF (decayed, missing, filled) Permanent Upper Incisors per Child	23
9.	Percentage of Children Having Caries-Free Deciduous Teeth	24
10.	Mean df (decayed, filled) Deciduous Teeth per Child	26
11.	Percentage Distribution of Children Examined, According to Oral Hygiene Status	27

CHARTS

I	Percentage of Children with Caries-Free Permanent Teeth, Sarnia-Brantford-Stratford, 1948-54	10
II	Mean DMF Permanent Teeth Per Child, Sarnia-Brantford-Stratford, 1948-54	16

BRANTFORD FLUORIDATION CARIES STUDY

PURPOSE OF THE STUDY

The Brantford Fluoridation Caries Study was undertaken with a view to finding out whether or not the raising of the fluoride content of a previously fluoride-free water supply to 1 part per million, by the mechanical addition of sodium fluoride, would reduce the incidence of dental caries to that which obtains where water supplies derive about 1 part per million of fluoride from deposits in the earth. Studies in various parts of the world (2), and later confirmed by our findings at Stratford, Ontario (3), had shown that where there is water-borne fluoride from underground deposits in a concentration of about 1 part per million, caries incidence was about 65 per cent lower than in places having fluoride-free water supplies, without any accompanying detectable ill effects.

HISTORY OF THE STUDY

Brantford instituted mechanical water fluoridation in 1945. Following discussions by its health authorities with the Faculty of Dentistry, University of Toronto, and with the Associate Committee on Dental Research, National Research Council of Canada, this department was requested to undertake a controlled study of the dental effects of fluoridation on Brantford children.

With the assistance of the Dental Division, Ontario Department of Health, planning and organization of the

Brantford Fluoridation Caries Study was done by the Research Division and the Dental Health Division of the Department of National Health and Welfare, in 1947. Sarnia and Stratford, two cities in Western Ontario known to be comparable to Brantford, except for the fluoride content of their water supplies, agreed to serve as controls.

Field studies began in 1948, and have been reported upon previously (4), (5), (6). This report discusses findings obtained in Stratford during November 1953, and in Brantford and Sarnia during the first quarter of 1954. These data have been analyzed in comparison with those obtained in 1948, 1951 and 1953.

SELECTION OF CHILDREN FOR EXAMINATION

The study compares a group of children (Brantford) who have used a mechanically fluoridated water supply continuously since June 1945, and who before that date did not use fluoridated water, with a group (Sarnia) who continuously since birth have not used fluoridated water, and a second group (Stratford) who have used continuously since birth water fluoridated from underground deposits of fluoride. Eligibility on this point is defined as including periods of absence of six weeks or less. Residence eligibility is determined from information supplied by the parents. Secondary schools, as well as primary schools, are canvassed for eligibles.

On the basis of data concerning the ordinary incidence of dental caries, it was decided to examine at least 500 children in each group, 6-8, 9-11, 12-14. Since eligible children in Brantford totalled over 2,500, sampling was indicated there and was carried out systematically by school and grade, beginning with a random start for each age group in the manner described in "A Suggested Methodology for Fluoridation Surveys in Canada" (7). Although the lower incidence of caries found in Stratford, and by 1951 in Brantford, indicated that a smaller sample size could be used, the total of at least 500 has been maintained where possible. No sampling was carried out in Sarnia in 1953, although for one age group (6-8) the total of eligibles might have been considered to indicate sampling; this age group was sampled in the 1954 Sarnia survey.

The totals of eligible children and of those examined are shown for each city by age group in Table 1 for 1948, 1951, 1953 and 1954. The totals chosen for examination by sampling are also given.

METHOD OF EXAMINING AND RECORDING

All examinations of the study have been conducted by the same examiner (H.K.B.), using a portable dental examining light of specific intensity kept at a constant distance, plane mouth mirrors and No. 5 Clev-dent explorers. The lowest limit in size for a caries lesion was defined as one in which the

TABLE 1

TOTAL CHILDREN ELIGIBLE AND TOTAL EXAMINED, BY AGE GROUP
Brantford, Sarnia and Stratford, 1948, 1951, 1953 and 1954

Year	Total Eligible				No. Chosen for Examination				No. Examined			
	Age 6-8	Age 9-11	Age 12-14	Total	Age 6-8	Age 9-11	Age 12-14	Total	Age 6-8	Age 9-11	Age 12-14	Total
Brantford (population 1951, 36,727)												
1948	963	816	747	2,526	624	602	600	1,826	619	595	593	1,807
1951	1,053	803	756	2,612	607	592	604	1,803	579	578	585	1,742
1953		Not Available			536	551	521	1,608	526	548	518	1,592
1954	1,288	901	776	2,965	512	515	515	1,542	490	502	490	1,482
Sarnia* (population 1951, 34,697)												
1948	677	580	495	1,752	-	-**	-	-	669	571	486	1,726
1951	720	634	514	1,868	-	-	-	-	691	619	506	1,816
1953	840	699	553	2,092	-	-	-	-	807	674	539	2,020
1954	847	599	597	2,043	564	-	-	1,760	553	580	547	1,680
Stratford (population 1951, 18,785)												
1948	511	434	376	1,321	-	-	-	-	505	432	371	1,308
1951	508	471	405	1,384	-	-	-	-	497	456	395	1,348
1954	685	493	390	1,568	-	-	-	-	662	486	383	1,531

* The population of Sarnia has increased rapidly in recent years. According to the 1941 Census the population was 18,734, and by municipal estimate it was 23,841 in 1949. For all three surveys, the children of nearby Point Edward which is served by the Sarnia water system, and which had a population of 1,838 in 1951, were included in the Sarnia survey. However, other outlying areas which were annexed by the city of Sarnia in 1953 were not included in the 1953 or 1954 surveys.

** Indicates that no sampling took place.

Note: The last survey in Stratford was conducted much closer to the end of the year than previously; the November 1953 data for Stratford are therefore termed "1954" in the new comparisons.

point of the explorer would stick and resist direct withdrawal, or in which softness was palpable. Hard enamel surfaces and enamel imperfections were not recorded as caries. Interproximal roughnesses capable of holding the explorer point were recorded as caries. Oral hygiene was also recorded as "good", "fair", "poor". All observable mottling of enamel was recorded.

A diagrammatic type of chart depicting both permanent and deciduous teeth was used for recording. Although, for purposes of this report, data are presented only for DMF (decayed + missing + filled) permanent teeth and df (decayed + filled) deciduous teeth, tooth decay was recorded in the detail necessary for analysis by number of surfaces affected. In addition, every tooth space was accounted for in order that later investigation might be made of a DMF tooth index of all erupted teeth per child.

FINDINGS

The hypothesis that a concentration of about 1 part per million of fluoride in the drinking water, mechanically added, inhibits the development of dental caries in the teeth of the users of the water, at least to the end of the fourteenth year of life, is further substantiated by the 1954 survey findings. There has been a decrease from survey to survey (1948-51-53-54) in the extent of caries at Brantford where fluoridation of the public water supply was begun in June 1945.

As this study does not include a pre-fluoridation survey, the full benefit which the teeth of Brantford children have received since fluoridation cannot be evaluated directly. However, an indication of this can be obtained by comparisons with the findings for Sarnia children (fluoride-free controls). By 1948, Brantford data were not greatly different from those of Sarnia. Since that time, Brantford has shown successive increases in the percentage.of caries-free children, and decreases in DMF teeth for all age groups studied. Tooth mortality has also decreased in Brantford (in all age groups under study). By 1954, the proportion of Brantford children 6-8 years with caries-free permanent teeth was about twice as great as for Sarnia, and the mean DMF tooth rate per child age 6-8 in Brantford was less than one quarter of the Sarnia rate for that age group. The benefit received by the 9-11 and the 12-14 age groups was also considerable by 1954, but because in these upper age groups, an appreciable proportion of the enamel had been formed before fluoride was added to the water, there was less scope for improvement.

The Stratford data are presented in the following tables for the purpose of indicating the degree of caries reduction which the Brantford children might be expected to attain after sufficient time had elapsed for those born since the beginning of fluoridation (June 1945) to produce a full set of permanent teeth. This requires a period of about 12 years from the time of birth. As yet only the teeth of

the Brantford 6-8 age group may be compared with those of the corresponding Stratford age group with any reasonable expectation of finding an equal degree of caries resistance.

In the sections following, detailed analysis is given of the results of all surveys of the study to date. Data are presented for (1) all permanent teeth, (2) first permanent (six-year) molars, (3) permanent upper incisors and (4) deciduous teeth. Statistics are given separately for first permanent molars since these are the permanent teeth which first reach the stage of having been fully calcified during the period of fluoridation (6-8 age group, 1953-54). In the case of the upper permanent incisors, the opportunity is afforded of observing the topical effect on enamel which had been formed and calcified before the institution of fluoridation. Except for upper incisors and deciduous teeth, data are presented for each of the three age groups, 6-8, 9-11, 12-14, which were chosen because of their relation to the tooth eruption pattern.

The indices used in this report to measure the extent of caries are (a) percentage of children having caries-free teeth, (b) tooth mortality rate (calculated only for all permanent teeth), and (c) mean DMF permanent teeth (for deciduous, mean df teeth). These indices and their standard errors are presented in turn for each type of tooth mentioned above.

TABLE 2

PERCENTAGE OF CHILDREN HAVING CARIES-FREE PERMANENT TEETH

Age Group	Year	Percentage of Children Having Caries-Free Permanent Teeth and Standard Error of Percentage		
		Sarnia	Brantford	Stratford
6- 8	1948	40.96 ± 1.901	46.69 ± 2.005	78.42 ± 1.831
	1951	32.71 ± 1.785	59.24 ± 2.043	65.19 ± 2.136
	1953	32.09 ± 1.644	69.20 ± 2.013	... ...
	1954	39.06 ± 2.075	75.92 ± 1.932	75.83 ± 1.664 *
9-11	1948	6.13 ± 1.001	5.71 ± 0.950	52.08 ± 2.404
	1951	3.55 ± 0.749	17.13 ± 1.566	35.75 ± 2.244
	1953	3.56 ± 0.718	23.36 ± 1.809	... ...
	1954	4.48 ± 0.859	25.70 ± 1.950	42.80 ± 2.244 *
12-14	1948	0.62 ± 0.350	1.18 ± 0.447	27.22 ± 2.310
	1951	1.19 ± 0.484	4.27 ± 0.839	22.03 ± 2.084
	1953	1.11 ± 0.449	8.69 ± 1.238	... ...
	1954	2.01 ± 0.600	7.14 ± 1.164	23.24 ± 2.158 *

Age Group	Year	Differences in Percentage of Children Having Caries-Free Permanent Teeth					
		Inter-City		Inter-Year			
		Sarnia-Brantford	Brantford-Stratford	Years	Sarnia	Brantford	Stratford
6- 8	1948	5.73 S	31.73 SS	1948-51	-8.25 SS	12.55 SS	-13.23 SS
	1951	26.53 SS	5.95 S	1951-53	-0.62 NS	9.96 SS	10.64 SS
	1953	37.11 SS	...	1953-54	6.97 S	6.72 S	
	1954	36.86 SS	-0.09 NS	1948-54	-1.90 NS	29.23 SS	-2.59 NS
9-11	1948	-0.42 NS	46.37 SS	1948-51	-2.58 S	11.42 SS	-16.33 SS
	1951	13.58 SS	18.62 SS	1951-53	0.01 NS	6.23 S	7.05 S
	1953	19.80 SS	...	1953-54	0.92 NS	2.34 NS	
	1954	21.22 SS	17.10 SS	1948-54	-1.65 NS	19.99 SS	-9.28 S
12-14	1948	0.56 NS	26.04 SS	1948-51	0.57 NS	3.09 SS	-5.19 NS
	1951	3.08 SS	17.76 SS	1951-53	-0.08 NS	4.42 S	1.21 NS
	1953	7.58 SS	...	1953-54	0.90 NS	-1.55 NS	
	1954	5.13 SS	16.10 SS	1948-54	1.39 S	5.96 SS	-3.98 NS

S Statistically significant at two standard error level;
SS Statistically significant at three standard error level;
NS Not statistically significant (p greater than 5%).

See p.9 for note concerning statistical significance.

Decrease indicated by minus sign.
* November 1953; considered as "1954" for comparison purposes.

Standard errors shown have not been adjusted for finite population correction and are therefore overstated. Where no sampling was done in Sarnia and Stratford, the sampling error is, of course, zero; but the standard errors shown are used in the comparison of pairs of averages.

Percentage of Children Having Caries-Free Permanent Teeth

In a group of children, any factor bringing about a decrease in the number of teeth affected by caries will tend to also bring about an increase in the number of caries-free children in this group (8). Table 2 (p. 8), and Fig. I (p. 10), show that, since the first survey in 1948, a significant increase* has been occurring in the proportion of Brantford children who have caries-free permanent teeth. These data also show a highly significant improvement, in all age groups, in Brantford children as compared with Sarnia children. As might be expected, however, the Stratford (1954) findings continue to show a higher percentage of caries-free children than were found in Brantford, except for children aged 6-8 years. By 1954, the percentage of caries-free Brantford children in this age group had continued to increase, to the point where it is now of the same order as that exhibited in Stratford children aged 6-8 years.

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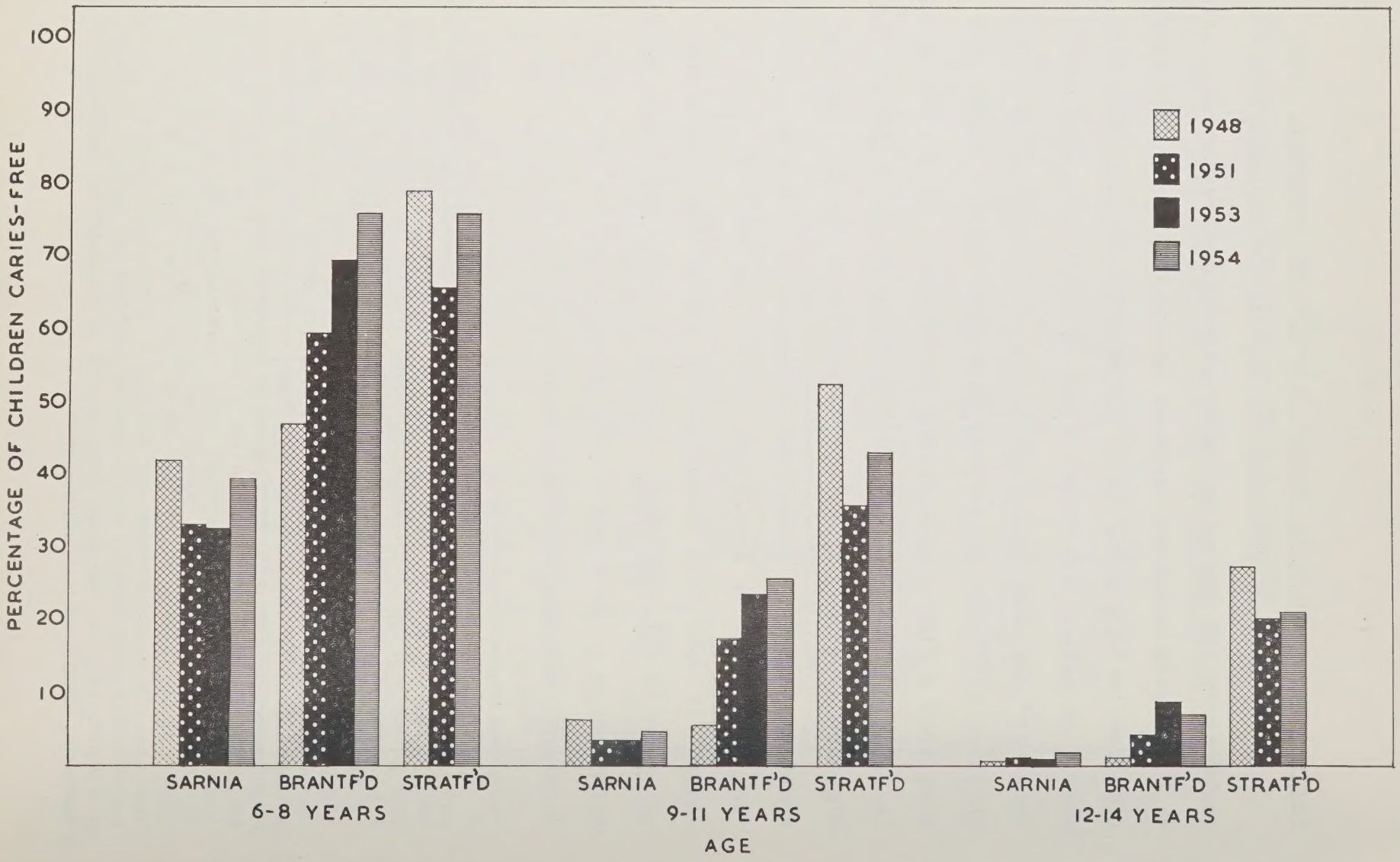
* The standard error is a measure of the variation which is associated with the sampling process. The difference between two index values is said to be statistically significant when the probability of it arising from chance or sampling variation, i.e., rather than from some specific factor such as fluoridation, is below some agreed value. The agreed levels of statistical significance are arbitrary but are generally assumed to be the two standard error and three standard error levels. The probability of obtaining, by chance, a difference of the magnitude of two standard errors between two observed values is about 0.0455 or just below 5 per cent. The odds against such a difference occurring are, therefore, about 21 to 1. For the three standard error level, the probability is less than one per cent (0.27 per cent) and the odds are 369 to 1 against this occurrence by chance. When differences of these magnitudes are found, particularly those as great as three standard errors, we may feel quite confident in discussing them in terms of our hypothesis.

FIG.I
CHILDREN WITH CARIES-FREE PERMANENT TEETH

SARNIA, BRANTFORD & STRATFORD, 1948-1954



However, the variation in percentage of children caries-free for all permanent teeth which has occurred between successive surveys for both Sarnia and Stratford, should be kept in mind when studying the data, since some of these inter-year differences can not be attributed to sampling.

The 6-8 age group in Brantford (1954) is the only one as yet whose permanent tooth eruption pattern has developed far enough since the beginning of fluoridation to permit a comparison of caries experience with that of the corresponding age group in Stratford on a basis of equality in relation to enamel fully calcified while fluoridated water was being used. All observable permanent tooth enamel of each of these two groups was calcified under the influence of fluoridated water, the one with well-water fluoride from underground deposits and the other from fluoride mechanically added to the water. As this particular group of Brantford children, born since 1945, become older and more of their permanent teeth erupt, further comparisons on this basis with Stratford in relation to the rest of the permanent dentition will become possible.

Tooth Mortality

The extent of permanent tooth mortality is measured by the number, per 100 children, of permanent teeth extracted or still in the mouth but too badly broken down and infected to be saved by ordinary treatment. Both preventive and treatment measures may have a decided effect on tooth mortality rates.

TABLE 3

MEAN TOOTH MORTALITY (MISSING AND IRREPARABLE) PERMANENT TEETH PER 100 CHILDREN

Age Group	Year	Mean Tooth Mortality (Missing and Irreparable Permanent Teeth) Per 100 Children and Standard Error of Mean		
		Sarnia	Brantford	Stratford
6- 8	1948	7.03 ± 1.367	1.62 ± 0.641	0.99 ± 0.441
	1951	10.42 ± 1.682	1.21 ± 0.516	1.41 ± 0.602
	1953	8.05 ± 1.455	2.09 ± 0.731	... ...
	1954	5.97 ± 1.480	1.43 ± 0.674	1.66 ± 1.839 *
9-11	1948	51.31 ± 4.348	28.91 ± 3.016	5.09 ± 1.445
	1951	52.02 ± 3.953	23.01 ± 2.522	4.82 ± 1.367
	1953	47.33 ± 4.097	14.23 ± 2.059	... ...
	1954	49.83 ± 3.973	13.94 ± 2.291	8.02 ± 1.510 *
12-14	1948	137.24 ± 7.985	84.32 ± 5.602	18.87 ± 2.911
	1951	125.30 ± 8.473	62.56 ± 4.592	20.76 ± 3.496
	1953	132.10 ± 8.820	47.30 ± 4.667	... ...
	1954	110.60 ± 7.221	44.49 ± 3.963	22.72 ± 3.553 *

Age Group	Year	Differences in Mean Tooth Mortality (Missing and Irreparable Permanent Teeth) Per 100 Children					
		Inter-City		Inter-Year			
		Sarnia-Brantford	Brantford-Stratford	Years	Sarnia	Brantford	Stratford
6- 8	1948	- 5.41 SS	- 0.63 NS	1948-51	3.39 NS	- 0.41 NS	0.42 NS
	1951	- 9.21 SS	0.20 NS	1951-53	- 2.37 NS	0.88 NS	) 0.25 NS
	1953	- 5.96 SS	...	1953-54	- 2.08 NS	- 0.66 NS	)
	1954	- 4.54 S	0.23 NS	1948-54	- 1.06 NS	- 0.19 NS	0.67 NS
9-11	1948	-22.40 SS	-23.82 SS	1948-51	0.71 NS	- 5.90 NS	-0.27 NS
	1951	-29.01 SS	-18.19 SS	1951-53	- 4.69 NS	- 8.78 S	)
	1953	-33.10 SS	...	1953-54	2.50 NS	- 0.29 NS	) 3.20 NS
	1954	-35.89 SS	- 5.92 S	1948-54	- 1.48 NS	-14.97 SS	2.93 NS
12-14	1948	-52.92 SS	-65.45 SS	1948-51	-11.94 NS	-21.76 SS	1.89 NS
	1951	-62.74 SS	-41.80 SS	1951-53	6.80 NS	-15.26 S	)
	1953	-84.80 SS	...	1953-54	-21.50 NS	- 2.81 NS	) 1.96 NS
	1954	-66.11 SS	-21.77 SS	1948-54	-26.64 S	-39.83 SS	3.85 NS

S Statistically significant at two standard error level;
SS Statistically significant at three standard error level;
NS Not statistically significant (p greater than 5%).

See p.9 for note concerning statistical significance.

Decrease indicated by minus sign.
* November 1953; considered as "1954" for comparison purposes.

Standard errors shown have not been adjusted for finite population correction and are therefore overstated. Where no sampling was done in Sarnia and Stratford, the sampling error is, of course, zero; but the standard errors shown are used in the comparison of pairs of averages.

In Table 3, mean tooth mortality per 100 children is shown for the Brantford-Sarnia-Stratford surveys to date. Although in almost all cases there has been a decrease in tooth mortality in Brantford between successive surveys, these decreases are not all significant. Further, even by the time of the first survey, mean tooth mortality in Brantford was much lower than in Sarnia, for all age groups.

In all surveys, Brantford has consistently had a higher tooth mortality than Stratford for the two older age groups, but the rates for the 6-8 age group have approximated the Stratford level. The Stratford tooth mortality for both the 9-11 and 12-14 groups has remained fairly constant while in Brantford, for both of these age groups, there has been a steady reduction toward the Stratford figures. However, it should be borne in mind that differences in treatment measures affect tooth mortality figures.

Mean DMF Permanent Teeth

Findings concerning dental caries experience in Brantford, and in the control cities, during the period 1948-1954, are presented in Table 4 and Fig. II. Essentially the same picture is revealed as was shown by the data relating to caries-free children: dental caries, in Brantford children, has been reduced markedly in all age groups under study. Since 1948, this decrease has amounted to 69% in the 6-8 age group, 44% in the 9-11 age group, and 36% in the case of children

TABLE 4

MEAN DMF (DECAYED, MISSING, FILLED) PERMANENT TEETH PER CHILD

Age Group	Year	Mean DMF Permanent Teeth Per Child and Standard Error of Mean		
		Sarnia	Brantford	Stratford
6- 8	1948	1.60 ± 0.064	1.41 ± 0.064	0.41 ± 0.040
	1951	1.99 ± 0.065	0.93 ± 0.055	0.75 ± 0.055
	1953	2.05 ± 0.062	0.63 ± 0.049	... ...
	1954	1.69 ± 0.073	0.44 ± 0.042	0.47 ± 0.039*
9-11	1948	4.21 ± 0.114	4.07 ± 0.093	1.13 ± 0.072
	1951	4.48 ± 0.102	2.85 ± 0.085	1.76 ± 0.081
	1953	4.67 ± 0.093	2.47 ± 0.080	... ...
	1954	4.44 ± 0.095	2.27 ± 0.084	1.46 ± 0.076*
12-14	1948	7.94 ± 0.200	7.68 ± 0.164	2.55 ± 0.130
	1951	8.55 ± 0.187	6.10 ± 0.144	3.12 ± 0.144
	1953	9.54 ± 0.192	5.51 ± 0.157	... ...
	1954	8.84 ± 0.062	4.89 ± 0.159	3.02 ± 0.139*

Age Group	Year	Differences in Mean DMF Permanent Teeth Per Child					
		Inter-City		Inter-Year			
		Sarnia-Brantford	Brantford-Stratford	Years	Sarnia	Brantford	Stratford
6- 8	1948	-0.19 S	-1.00 SS	1948-51	0.39 SS	-0.48 SS	0.34 SS
	1951	-1.06 SS	-0.18 SS	1951-53	0.06 NS	-0.30 SS	)-0.28 SS
	1953	-1.42 SS	...	1953-54	-0.36 SS	-0.19 S	)
	1954	-1.25 SS	0.03 NS	1948-54	0.09 NS	-0.97 SS	0.06 NS
9-11	1948	-0.14 NS	-2.94 SS	1948-51	0.27 NS	-1.22 SS	0.63 SS
	1951	-1.63 SS	-1.09 SS	1951-53	0.19 NS	-0.38 SS	)
	1953	-2.20 SS	...	1953-54	-0.23 NS	-0.20 NS	)-0.30 S
	1954	-2.17 SS	-0.81 SS	1948-54	0.23 NS	-1.80 SS	0.33 SS
12-14	1948	-0.26 NS	-5.13 SS	1948-51	0.61 S	-1.58 SS	0.57 SS
	1951	-2.45 SS	-2.98 SS	1951-53	0.99 SS	-0.59 S	)
	1953	-4.03 SS	...	1953-54	-0.70 SS	-0.62 S	)-0.10 NS
	1954	-3.95 SS	-1.87 SS	1948-54	0.90 SS	-2.79 SS	0.47 S

S Statistically significant at two standard error level;)See p.9 for
SS Statistically significant at three standard error level;)note concerning
NS Not statistically significant (p greater than 5%).)statistical
)significance.

Decrease indicated by minus sign.
* November 1953; considered as "1954" for comparison purposes.

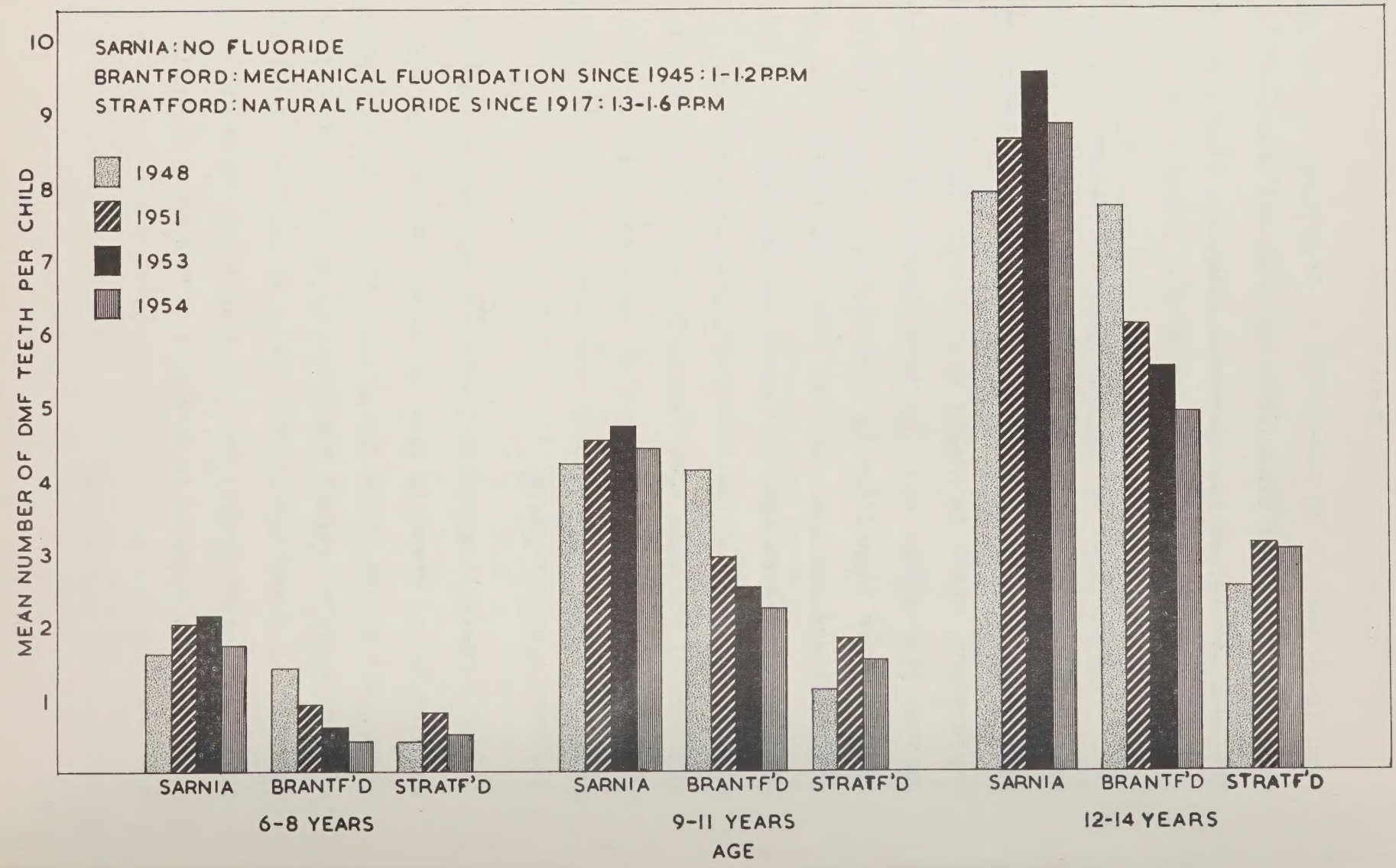
Standard errors shown have not been adjusted for finite population correction and are therefore overstated. Where no sampling was done in Sarnia and Stratford, the sampling error is, of course, zero; but the standard errors shown are used in the comparison of pairs of averages.

aged 12-14 years. In Sarnia and in Stratford, on the other hand, dental caries experience has remained either at about the 1948 levels, or has increased slightly, in all age groups studied.

Comparison of the Brantford and Sarnia findings shows that as early as 1951 dental caries experience in Brantford children was less than that found in Sarnia children. This improvement, which is highly significant, has continued from year to year since then. In 1948, Brantford children were found to have significantly more dental caries than Stratford children, age for age. By 1953, mean DMF tooth rates of Brantford children aged 6-8 years had decreased to a point within the range of the rates exhibited by Stratford children of the same age. Again in 1954, it has been found that dental caries experience of children in the 6-8 age group in Brantford is of the same order as that of Stratford children aged 6-8 years.

During the period 1948-1954 mean DMF tooth rates have decreased steadily also in Brantford children aged 9-11 years, and in the 12-14 age group. Even by 1954, however, it was too early to expect Brantford to equal the Stratford picture, in these age groups. Many of the Brantford children in the two older groups are children whose permanent tooth formation was already in progress at the time fluoridation

FIG. II
DMF PERMANENT TEETH PER CHILD
SARNIA, BRANTFORD & STRATFORD, 1948-1954



of that city's water was instituted. Study of the data presented in Table 4 in conjunction with a chronological table of enamel calcification suggests a direct relationship between the degree of caries-resistance of tooth enamel and its developmental status at the time the child began to drink fluoridated water. That a significant amount of caries-resistance is conferred on completed enamel by contact with fluoridated water is brought out clearly by the data for the permanent upper incisors (see p. 21). However, the major benefit appears to be derived by its use, continuously, during the total period of enamel formation.

First Permanent Molars

Since the first permanent molars are the most caries-susceptible teeth of the permanent dentition, findings concerning the dental caries experience of these teeth are presented separately, in Tables 5 and 6.

The Brantford data presented in Table 6 show there has been a reduction at all ages, in the number of DMF first permanent molars every year since 1948. Over the period from 1948 to 1954, the reduction was most marked in the 6-8 age group: 69%. In 1948, Brantford children had significantly more caries in first permanent molars at all ages, than did Stratford children. By 1953, the Brantford children aged 6-8 years included a number whose first permanent molars had been fully calcified and erupted after 1945, when fluoridation of Brantford's water was begun. By 1954, the first permanent

TABLE 5

PERCENTAGE OF CHILDREN HAVING CARIES-FREE FIRST PERMANENT MOLARS

Age Group	Year	Percentage of Children Having Caries-Free First Permanent Molars and Standard Error of Percentage		
		Sarnia	Brantford	Stratford
6- 8	1948	41.26 ± 1.904	46.85 ± 2.006	78.42 ± 1.831
	1951	32.71 ± 1.785	59.76 ± 2.038	65.19 ± 2.136
	1953	32.34 ± 1.646	70.15 ± 1.996	... ...
	1954	38.52 ± 2.069	76.53 ± 1.915	75.83 ± 1.664 *
9-11	1948	6.65 ± 1.046	6.22 ± 0.989	52.31 ± 2.403
	1951	4.20 ± 0.806	17.82 ± 1.591	36.40 ± 2.253
	1953	2.97 ± 0.657	23.36 ± 1.809	... ...
	1954	4.66 ± 0.875	26.69 ± 1.974	44.24 ± 2.251 *
12-14	1948	1.03 ± 0.451	2.02 ± 0.575	33.69 ± 2.454
	1951	3.36 ± 0.806	4.79 ± 0.884	26.33 ± 2.215
	1953	1.67 ± 0.557	9.46 ± 1.288	... ...
	1954	3.11 ± 0.742	8.78 ± 1.278	28.98 ± 2.318 *

Age Group	Year	Differences in Percentage of Children Having Caries-Free First Permanent Molars					
		Inter-City		Inter-Year			
		Sarnia-Brantford	Brantford-Stratford	Years	Sarnia	Brantford	Stratford
6- 8	1948	5.59 S	31.57 SS	1948-51	-8.55 SS	12.91 SS	-13.23 SS
	1951	27.05 SS	5.43 NS	1951-53	-0.37 NS	10.39 SS	10.64 SS
	1953	37.81 SS	...	1953-54	6.18 S	6.38 S	
	1954	38.01 SS	-0.70 NS	1948-54	-2.74 NS	29.68 SS	- 2.59 NS
9-11	1948	-0.43 NS	46.09 SS	1948-51	-2.45 NS	11.60 SS	-15.91 SS
	1951	13.62 SS	18.58 SS	1951-53	-1.23 NS	5.54 S	7.84 S
	1953	20.39 SS	...	1953-54	1.69 NS	3.33 NS	
	1954	22.03 SS	17.55 SS	1948-54	-1.99 NS	20.47 SS	-8.07 S
12-14	1948	0.99 NS	31.67 SS	1948-51	2.33 S	2.44 S	-7.36 S
	1951	1.43 NS	21.54 SS	1951-53	-1.69 NS	4.67 S	2.65 NS
	1953	7.79 SS	...	1953-54	1.44 NS	-0.68 NS	
	1954	5.67 SS	20.20 SS	1948-54	2.08 S	6.76 SS	-4.71 NS

S Statistically significant at two standard error level;
SS Statistically significant at three standard error level;
NS Not statistically significant (p greater than 5%)

See p.9 for note concerning statistical significance.

Decrease indicated by minus sign.
* November 1953; considered as "1954" for comparison purposes.

Standard errors shown have not been adjusted for finite population correction and are therefore overstated. Where no sampling was done in Sarnia and Stratford, the sampling error is, of course, zero; but the standard errors shown are used in the comparison of pairs of averages.

molars of Brantford children aged 6-8 years were for the most part calcified under conditions of exposure to fluoridated water, and therefore closely comparable to those of Stratford children. As shown in Table 6, no significant difference in first permanent molar caries experience was found between these children in Brantford and Stratford.

In 1948 dental caries in first permanent molar teeth was found to be of the same order in both Brantford and Sarnia. By 1951 it had increased slightly in this type of tooth in Sarnia. Brantford children as compared with Sarnia children had begun to show a significant reduction in the number of DMF first permanent molars. Again in 1953, and in 1954 it was found that there were significantly fewer carious first permanent molar teeth in Brantford than in Sarnia at all ages.

Until now, most of the effect of fluoridated water in the older half of the 9-11 and all of the 12-14 age groups in Brantford presumably would be topical. Certainly the first permanent molars of children in these age groups had been completely or nearly completely formed prior to the date when fluoridation was begun. Despite this, during the period 1948-1954, there has been a 38% reduction in DMF first permanent molars in Brantford children aged 9-11 years, and a 17% reduction in the case of 12-14 year children. As yet, however, Brantford children in these age groups have not reached the low levels of caries experience exhibited by Stratford children of similar age.

TABLE 6

MEAN DMF (DECAYED, MISSING, FILLED) FIRST PERMANENT MOLARS PER CHILD

Age Group	Year	Mean DMF First Permanent Molars Per Child and Standard Error of Mean		
		Sarnia	Brantford	Stratford
6- 8	1948	1.55 ± 0.061	1.39 ± 0.063	0.41 ± 0.040
	1951	1.96 ± 0.063	0.92 ± 0.055	0.75 ± 0.055
	1953	1.99 ± 0.058	0.61 ± 0.048	... ± ...
	1954	1.66 ± 0.068	0.43 ± 0.041	0.47 ± 0.038 *
9-11	1948	3.15 ± 0.051	3.26 ± 0.048	1.07 ± 0.065
	1951	3.43 ± 0.043	2.52 ± 0.064	1.62 ± 0.072
	1953	3.56 ± 0.037	2.26 ± 0.067	... ± ...
	1954	3.38 ± 0.047	2.02 ± 0.070	1.31 ± 0.067 *
12-14	1948	3.62 ± 0.036	3.65 ± 0.033	1.76 ± 0.082
	1951	3.63 ± 0.040	3.42 ± 0.045	1.99 ± 0.080
	1953	3.76 ± 0.030	3.15 ± 0.057	... ± ...
	1954	3.66 ± 0.038	3.04 ± 0.060	1.88 ± 0.079 *

Age Group	Year	Differences in Mean DMF First Permanent Molars Per Child					
		Inter-City		Inter-Year			
		Sarnia-Brantford	Brantford-Stratford	Years	Sarnia	Brantford	Stratford
6- 8	1948	-0.16 NS	-0.98 SS	1948-51	0.41 SS	-0.47 SS	0.34 SS
	1951	-1.04 SS	-0.17 S	1951-53	0.03 NS	-0.31 SS	)
	1953	-1.38 SS	...	1953-54	-0.33 SS	-0.18 S	) -0.28 SS
	1954	-1.23 SS	0.04 NS	1948-54	0.11 NS	-0.96 SS	0.06 NS
9-11	1948	0.11 NS	-2.19 SS	1948-51	0.28 SS	-0.74 SS	0.55 SS
	1951	-0.91 SS	-0.90 SS	1951-53	0.13 S	-0.26 S	)
	1953	-1.30 SS	...	1953-54	-0.18 S	-0.24 S	) -0.31 SS
	1954	-1.36 SS	-0.71 SS	1948-54	0.23 SS	-1.24 SS	0.24 S
12-14	1948	0.03 NS	-1.89 SS	1948-51	0.01 NS	-0.23 SS	0.23 S
	1951	-0.21 SS	-1.43 SS	1951-53	0.13 S	-0.27 SS	)
	1953	-0.61 SS	...	1953-54	-0.10 NS	-0.11 NS	) -0.11 NS
	1954	-0.62 SS	-1.16 SS	1948-54	0.04 NS	-0.61 SS	0.12 NS

S Statistically significant at two standard error level;)
SS Statistically significant at three standard error level;) See p.9 for note concerning statistical significance.
NS Not statistically significant (p greater than 5%).)

Decrease indicated by minus sign.
* November 1953; considered as "1954" for comparison purposes.

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Upper Permanent Incisors

The upper permanent incisors show more dramatically than any other type of tooth the effect of water-borne fluorides. The enamel of these teeth for the Brantford 12-14 year age group in 1954 was for the most part calcified 9 to 11 years ago, i.e., before fluoride was added to the water there; yet the percentage of children caries-free in that age group is greater than that for the corresponding age group in Sarnia. The difference was also significant for the 1951 and 1953 surveys. This must be presumed to be due to the topical effect of the fluoride on already calcified enamel. (See Tables 7 and 8).

In the Brantford 9-11 year age group the enamel of the incisors was calcified to a much lesser degree, before fluoridation began, than that of the 12-14 year age group. Here (9-11 age group), the Stratford condition is much more closely approached by both the Brantford 1953 and 1954 data. However, not until 1956, when the 6-8 age group of 1953 in Brantford becomes the 9-11 age group can true equality with that age group for Stratford be expected.

TABLE 7

PERCENTAGE OF CHILDREN HAVING CARIES-FREE PERMANENT UPPER INCISORS

Age Group	Year	Percentage of Children Having Caries-Free Permanent Upper Incisors and Standard Error of Percentage		
		Sarnia	Brantford	Stratford
9-11	1948	76.53 ± 1.774	82.86 ± 1.544	97.07 ± 0.807
	1951	80.94 ± 1.580	94.46 ± 0.948	96.93 ± 0.812
	1953	74.33 ± 1.683	96.17 ± 0.817	... ...
	1954	71.90 ± 1.867	92.23 ± 1.195	95.47 ± 0.943 *
12-14	1948	53.91 ± 2.261	56.16 ± 2.037	95.69 ± 1.053
	1951	53.36 ± 2.217	69.40 ± 1.905	90.38 ± 1.482
	1953	40.82 ± 2.117	77.03 ± 1.849	... ...
	1954	39.67 ± 2.092	74.08 ± 1.979	84.60 ± 1.845 *

Age Group	Year	Differences in Percentage of Children Having Caries-Free Permanent Upper Incisors					
		Inter-City		Inter-Year			
		Sarnia-Brantford	Brantford-Stratford	Years	Sarnia	Brantford	Stratford
9-11	1948	6.33 S	14.21 SS	1948-51	4.41 NS	11.60 SS	-0.14 NS
	1951	13.52 SS	2.47 NS	1951-53	- 6.61 S	1.71 NS	-1.46 NS
	1953	21.84 SS	...	1953-54	- 2.43 NS	- 3.94 S	
	1954	20.33 SS	3.24 S	1948-54	- 4.63 NS	9.37 SS	-1.60 NS
12-14	1948	2.25 NS	39.53 SS	1948-51	- 0.55 NS	13.24 SS	-5.31 S
	1951	16.04 SS	20.98 SS	1951-53	-12.54 SS	7.63 S	-5.78 S
	1953	36.21 SS	...	1953-54	- 1.15 NS	-2.95 NS	
	1954	34.41 SS	10.52 SS	1948-54	-14.24 SS	17.92 SS	-11.09 SS

S Statistically significant at two standard error level;
SS Statistically significant at three standard error level;
NS Not statistically significant (p greater than 5%).

See p.9 for note concerning statistical significance.

Decrease indicated by minus sign.
* November 1953; considered as "1954" for comparison purposes.

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TABLE 8

MEAN DMF (DECAYED, MISSING, FILLED) PERMANENT UPPER INCISORS PER CHILD

Age Group	Year	Mean DMF Permanent Upper Incisors Per Child and Standard Error of Mean		
		Sarnia	Brantford	Stratford
9-11	1948	0.56 ± 0.048	0.34 ± 0.034	0.01 ± 0.007
	1951	0.43 ± 0.041	0.11 ± 0.021	0.04 ± 0.011
	1953	0.56 ± 0.043	0.05 ± 0.013	... ± ...
	1954	0.60 ± 0.046	0.11 ± 0.018	0.07 ± 0.017 *
12-14	1948	1.16 ± 0.066	1.05 ± 0.058	0.07 ± 0.020
	1951	1.16 ± 0.065	0.64 ± 0.046	0.15 ± 0.025
	1953	1.56 ± 0.067	0.53 ± 0.048	... ± ...
	1954	1.52 ± 0.065	0.50 ± 0.044	0.25 ± 0.034 *

Age Group	Year	Differences in Mean DMF Permanent Upper Incisors Per Child					
		Inter-City		Inter-Year			
		Sarnia-Brantford	Brantford-Stratford	Years	Sarnia	Brantford	Stratford
9-11	1948	-0.22 SS	-0.33 SS	1948-51	-0.13 S	-0.23 SS	0.03 SS
	1951	-0.32 SS	-0.07 SS	1951-53	0.13 S	-0.06 S	0.03 NS
	1953	-0.51 SS	...	1953-54	0.04 NS	0.06 S	
	1954	-0.49 SS	-0.04 NS	1948-54	0.04 NS	-0.23 SS	0.06 SS
12-14	1948	-0.11 NS	-0.98 SS	1948-51	0.00 NS	-0.41 SS	0.08 NS
	1951	-0.52 SS	-0.49 SS	1951-53	0.40 SS	-0.11 NS	0.10 S
	1953	-1.03 SS	...	1953-54	-0.04 NS	-0.03 NS	
	1954	-1.02 SS	-0.25 SS	1948-54	0.36 SS	-0.55 SS	0.18 SS

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NS Not statistically significant (p greater than 5%).

See p.9 for note concerning statistical significance.

Decrease indicated by minus sign.
*November 1953; considered as "1954" for comparison purposes.

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TABLE 9

PERCENTAGE OF CHILDREN HAVING CARIES-FREE DECIDUOUS TEETH

Age Group	Year	Percentage of Children Having Caries-Free Deciduous Teeth and Standard Error of Percentage		
		Sarnia	Brantford	Stratford
6- 8	1948	10.16 ± 1.170	12.28 ± 1.320	35.65 ± 2.131
	1951	10.13 ± 1.146	22.80 ± 1.743	30.38 ± 2.063
	1953	9.42 ± 1.027	21.67 ± 1.797	... ...
	1954	8.32 ± 1.174	29.18 ± 2.054	31.42 ± 1.804*
9-11	1948	33.63 ± 1.977	34.96 ± 1.956	40.97 ± 2.366
	1951	32.47 ± 1.883	33.56 ± 1.965	41.23 ± 2.305
	1953	37.39 ± 1.864	40.33 ± 2.095	... ...
	1954	37.93 ± 2.015	38.65 ± 2.173	41.98 ± 2.239*

Age Group	Year	Differences in Percentage of Children Having Caries-Free Deciduous Teeth					
		Inter-City		Inter-Year			
		Sarnia-Brantford	Brantford-Stratford	Years	Sarnia	Brantford	Stratford
6- 8	1948	2.12 NS	23.36 SS	1948-51	-0.03 NS	10.52 SS	-5.26 NS
	1951	12.67 SS	7.58 S	1951-53	-0.71 NS	-1.13 NS	)
	1953	12.25 SS	...	1953-54	-1.10 NS	7.51 S	) 1.04 NS
	1954	20.86 SS	2.24 NS	1948-54	-1.84 NS	16.90 SS	-4.23 NS
9-11	1948	1.33 NS	6.01 S	1948-51	-1.16 NS	-0.40 NS	0.26 NS
	1951	1.09 NS	7.67 S	1951-53	4.92 NS	6.77 S	)
	1953	2.94 NS	...	1953-54	0.54 NS	-1.68 NS	) 0.75 NS
	1954	0.72 NS	3.33 NS	1948-54	4.30 NS	3.69 NS	1.01 NS

S Statistically significant at two standard error level;)See p.9 for
SS Statistically significant at three standard error level;)note concerning
NS Not statistically significant (p greater than 5%).)statistical
)significance.

Decrease indicated by minus sign.
* November 1953; considered as "1954" for comparison purposes.

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Deciduous Teeth

Our experience has been that a df index for primary teeth does not provide as reliable an index of caries experience as does the DMF index for permanent teeth. Extraction of more d (decayed) teeth in a given community in one year than in another, or more extractions in one community than in another may affect the reliability of the information to some degree. It is at least theoretically possible that a high deciduous caries rate in a community may lead to a higher extraction rate there, thus obliterating the evidence. Nevertheless, it is of interest to note that the index values for deciduous teeth (Tables 9 and 10) indicate the same general trends as between cities and surveys as shown by the data for permanent teeth. In 1951, 1953 and 1954 deciduous teeth in the 6-8 age group were considerably less carious in Brantford than in Sarnia. This, with the Brantford inter-year differences for that age group for the four successive surveys, suggests that primary teeth whose enamel calcification has been affected by fluoridated water since birth are considerably more caries-resistant than those in the fluoride-free control city. The benefit derived by the Brantford 9-11 year age group in the primary dentition is clearly less than that obtained by the 6-8 age group.

TABLE 10

MEAN df (decayed, filled) DECIDUOUS TEETH PER CHILD

Age Group	Year	Mean df Deciduous Teeth Per Child and Standard Error of Mean		
		Sarnia	Brantford	Stratford
6- 8	1948	4.89 ± 0.122	4.95 ± 0.134	2.20 ± 0.107
	1951	4.89 ± 0.119	3.58 ± 0.126	2.62 ± 0.115
	1953	5.17 ± 0.113	3.22 ± 0.125	... ...
	1954	5.21 ± 0.132	2.76 ± 0.120	2.63 ± 0.110 *
9-11	1948	2.50 ± 0.111	2.37 ± 0.101	1.66 ± 0.095
	1951	2.41 ± 0.101	2.25 ± 0.098	1.76 ± 0.094
	1953	2.26 ± 0.094	1.94 ± 0.097	... ...
	1954	2.11 ± 0.098	1.93 ± 0.095	1.58 ± 0.089 *

Age Group	Year	Differences in Mean df Deciduous Teeth Per Child					
		Inter-City		Inter-Year			
		Sarnia-Brantford	Brantford-Stratford	Years	Sarnia	Brantford	Stratford
6- 8	1948	0.06 NS	-2.75 SS	1948-51	0.00 NS	-1.37 SS	0.42 S
	1951	-1.31 SS	-0.96 SS	1951-53	0.28 NS	-0.36 S	) 0.01 NS
	1953	-1.95 SS	...	1953-54	0.04 NS	-0.46 S	)
	1954	-2.45 SS	-0.13 NS	1948-54	0.32 NS	-2.19 SS	0.43 S
9-11	1948	-0.13 NS	-0.71 SS	1948-51	-0.09 NS	-0.12 NS	0.10 NS
	1951	-0.16 NS	-0.49 SS	1951-53	-0.15 NS	-0.31 S	)
	1953	-0.32 S	...	1953-54	-0.15 NS	-0.01 NS	)-0.18 NS
	1954	-0.18 NS	-0.35 S	1948-54	-0.39 S	-0.44 SS	-0.08 NS

S Statistically significant at two standard error level;)See p.9 for
SS Statistically significant at three standard error level;)note concerning
NS Not statistically significant (p greater than 5%).)statistical
)significance.

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Oral Hygiene

Table 11 shows an assessment of the oral hygiene in each of the three cities. It is considered that any claim to a reasonable degree of validity of these figures rests upon the fact that all the examinations to date have been done by the same examiner. Classification and recording of oral hygiene was undertaken because it was considered that marked differences in oral hygiene as between the test and the control groups might conceivably affect the findings -- or at least might be taken into consideration as a modifying factor, although not a strictly measurable one. However, the figures here suggest that, since 1948, differences in oral hygiene status could not have been a major factor in either the caries level changes within Brantford or the caries level differences between the control cities.

TABLE 11

PERCENTAGE DISTRIBUTION OF CHILDREN EXAMINED, ACCORDING TO ORAL HYGIENE STATUS

City	Year	Percentage of Children Examined			
		Good	Fair	Poor	Total
Brantford	1948	34.3	30.6	35.1	100.00
Brantford	1951	34.2	32.8	33.0	100.00
Brantford	1953	38.7	36.4	24.9	100.00
Brantford	1954	36.8	31.4	31.8	100.00
Sarnia	1948	19.7	28.0	52.3	100.00
Sarnia	1951	19.2	36.3	44.5	100.00
Sarnia	1953	28.0	37.6	34.4	100.00
Sarnia	1954	19.2	27.5	53.3	100.00
Stratford	1948	17.8	37.5	44.7	100.00
Stratford	1951	10.1	42.1	47.8	100.00
Stratford	1954	31.0	41.1	27.5	100.00

Mottled Enamel

In a previous report (5) the appearance of a few cases of mild mottling, detectable only by an experienced observer, were described from our findings at Stratford, where the water contains 1.3 to 1.6 parts per million of fluoride. These were barely discernible whitish flecks and not unsightly. The newly erupted six-year molars observed in the 1954 survey in Brantford, the total enamel calcification of which had taken place since the water was fluoridated there, showed in some cases this same very mild type of mottling which can be detected only by an experienced examiner. But in Sarnia, where the fluoride content of the water is negligible, a few cases of mild mottling resembling very closely those seen in Stratford and Brantford were also observed and recorded. It is apparent therefore, that mottling does occur in communities where water-borne fluorides could not be the cause.

Other Effects of Fluoridation

The Medical Officer of Health for Brant County, Dr. W.L. Hutton, reports that no ill-effects of any kind have been detected there, after more than 9 years of fluoridation. This year he asked the Brantford physicians if they had observed any ill effects that might be attributable to fluoride. The following reply dated May 10th, 1954, was received:

"At a recent meeting of the Medical Staff of the Brantford General Hospital, the members were asked if they had seen any untoward effects from the use of fluoridated water in this vicinity, with the result that no such observations had been made by any practitioner to the best of our knowledge."

A similar statement, without special reference to Brantford, was made in an official joint pronouncement issued by the Canadian Dental Association and the Canadian Medical Association in January, 1953 (9). This was followed by an official approval of fluoridation by the Canadian Medical Association at its 87th Annual Meeting, in June 1954, at Vancouver (10).

SUMMARY

The 1954 findings of the Brantford Fluoridation Study show a continuing reduction in dental caries in Brantford children, during the year since the study was last reported upon (6). Review of these data, together with those of earlier surveys in 1948, 1951, 1953 (4,5,6), shows that a statistically significant and progressive reduction in the dental caries experience of Brantford children, at all ages studied, has taken place from year to year since 1948.

During the period 1948-1954, dental caries has been reduced by approximately 69% in Brantford children aged

6-8 years, by 44% in the 9-11 age group, and by 36% in the case of the 12-14 age group. During the same period, dental caries experience of children in the two control cities, on the other hand, either has remained at about the 1948 levels, or has increased slightly, at all ages studies.

After nine years of fluoridation in Brantford, the differences between caries resistance of Brantford children and that of Sarnia children (non-fluoride control), age for age, have become most marked. Of even greater significance, however, has been the observation (1953, again in 1954) that there are no longer any significant differences, either in the prevalence or incidence of dental caries, between Brantford and Stratford children, aged 6-8 years. The gap between dental caries levels of Brantford and Stratford children in the older age groups has narrowed considerably. It is still too early, however, to expect Brantford caries levels, in the case of children aged 9-14 years, to fall within the range exhibited by Stratford children of the same age. Even in 1954, there was a preponderance of Brantford children in the older age groups, whose tooth enamel formation had been considerably advanced at the time fluoridation was instituted in that city, in 1945.

Our study has revealed no evidence of either a dental or a medical nature which would contraindicate the fluoridation of a public water supply to a level similar to that in use in Brantford. Similar conclusions are expressed in official

statements by the Canadian Dental Association and the Canadian Medical Association. Both of these bodies have officially approved fluoridation (10, 11). However, it is suggested that communities now planning fluoridation might profitably recognize the possibilities of adding to the present knowledge on the subject. The adoption of uniform methods of carrying out dental surveys, along with sound statistical procedures, would make possible a comparison of findings between different communities and thereby add to the information now available, while at the same time providing health authorities with a reliable basis upon which to report the established dental health benefits of fluoridation. To assist in this matter the Dental Health Division and the Research Division have prepared a publication which may be had from the former on request (7).

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